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RELATION OF DIGGER OPERATION TO POTATO TUBER INJURY

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Mechanical injury is one of the most serious defects found on potatoes in our markets. Much of this is avoidable. However, it is only recently that the causes of such defects have been studied and called to the attention of potato growers. Hastings (1) in 1931 reported that 70 per cent of the defects found on inspection of 1050 cars of potatoes in North Dakota in 1929-'30 were attributable to mechanical injury. A later survey in the field indicated that about 40 per cent of this injury was caused by the digger. Werner (2) found that from 16 to 31 per cent of the crop of certified seed Triumphs produced in eight counties of Nebraska during 1928, 1929 and 1930 were mechanically injured. The writer (3) reported an average of about 10 per cent of the tubers dug from 238 New York fields in 1931 and 1932 to be either bruised or cut by the digger. Such facts as these indicate that either the growers are generally careless about digger operation or our standard makes of diggers are mechanically at fault. Of 161 New York farms surveyed in the fall of 1932, over 90 per cent were using one of six standard makes of chain elevator diggers. In the amount of tuber injury resulting from these diggers, no significant differences could be observed.

Rear Attachment, a Causal Factor

In New York, about 85 per cent of the chain elevator diggers in use are equipped with rear attachments, the other 15 per cent of these being of the continuous apron type. The shaker-bar type of attachment is somewhat more common than the extension elevator. Hardenburg (3) reported about 35 per cent less tuber bruising where the continuous apron rather than the rear attachment was used. This leads to the question whether much digger injury is the direct result of the

drop from the front elevator to the rear attachment. Hastings (4) stated that in North Dakota "By far the greatest injury occurs in dropping from the elevator apron to the rear attachment."

In connection with a tuber defect survey in 15 counties of New York in the fall of 1932, the writer measured the length of drop from the front apron to the rear attachment on 88 elevator diggers. This drop ranged from 11 to 18 inches, the average being 12.48 inches. The relation of length of drop to the percentage of bruised tubers found in the ground samples is shown in table 1.

Obviously not all of this bruising could be attributed to the rear attachment. However, there seems to be a direct and consistent relationship between length of drop and amount of bruising. For each increase of about 2 inches in drop, the number of bruised tubers increased 2.7 per cent.

TABLE 1.—*Relation of drop from digger elevator to rear attachment to tuber bruising on 88 New York farms in 1932.*

Range of Drop (inches)	Average Drop (inches)	Number of Fields	Number of Bruised Tubers (ground sample) (per cent)
11.0 or less	10.50	27	7.44
11.5-13.0	12.47	36	10.14
14.0-18.0	14.64	25	12.84
Total and averages	12.48	88	10.08

Soil Cushion Reduces Injury

It is generally conceded that the soil carried on the digger chain acts as a cushion and is very effective in reducing tuber injury. Werner (2) in a series of cracking tests compared the amount of injury resulting when freshly dug tubers were dropped 9½ inches on bare iron rods with that obtained when they were dropped on the same rods covered with a 1/16 inch layer of soil. The soil layer reduced the number of cracked tubers 5 per cent and the total length of cracks 38.4 per cent. Hardenburg (3) reported results of a field survey on 72 farms in 1932 showing a reduction from 13.8 per cent bruised tubers where soil was carried up only 25 per cent of the front elevator to 5.7 per cent injury where the elevator was more than three-fourths covered. Probably every experienced grower knows how little soil is carried when the soil is dry and when his digger chain operates rapidly. The two obvious alternatives to reduce injury under such conditions are to set the digger deeper and to operate more slowly. The relation of speed of operation to amount of soil carried on the digger chain is shown in table 2.

TABLE 2.—*Relation of speed of digger chain to amount of soil carried.*
(*Power take-off digger with continuous apron*)

Speed	Chain Gear R. P. M.*		Digger Set at Ordinary Depth	Digger Set Deep
	Digger Ordinary Depth	Digger Set Deep		
Low	7.2	7.2	Chain entirely covered	Chain entirely covered
Medium	14.4	12.0	Chain ½ covered	Chain entirely covered
High	19.2	14.4	Chain ¼ covered	Chain ¾ covered

*Digger chain revolutions per minute.

One of the principal reasons given by potato growers for the general practice of ridge culture is that it affords easier digging. If ridging results in more soil being carried on the digger chain at harvest time, then it should also be a means of reducing digger injury to the tubers. This relationship is not easy to establish. However, it is possible to relate height of ridge to digger injury and thereby deduce that any variation in injury is due to variation in the amount of soil carried on the chain. Height of ridge was measured in 254 potato fields during the harvest seasons of 1931 and 1932. The method required the use of two yardsticks, one laid horizontally across the ridges of two adjoining rows, the other placed upright in the trough of the furrow between the rows. As the rows were dug, the percentage of cut and bruised tubers was determined by a careful examination of samples of 100 tubers each. Tubers sliced by the digger point were designated as cut, whereas all other mechanical injury except skinning was classed as bruising. Any surface injury insufficient to result in liberation of juice under pressure of the thumb was defined as a bruise. This means that many tubers counted as bruised would ordinarily be overlooked under casual observation. The relation between height of ridge and digger injury is shown in table 3.

TABLE 3.—*Relation of height of ridge to tuber injury.*
(*Average of 254 New York potato fields 1931 and 1932*)

Range in Height of Ridge (inches)	Average Height of Ridge (inches)	Number of Fields	Tubers Cut (per cent)	Tubers Bruised (per cent)
2.5-4.0	3.51	64	2.36	8.02
4.5-5.5	5.11	90	1.68	10.53
6.0-7.0	6.31	76	1.87	8.12
7.5-9.0	7.94	24	1.54	12.42
Total and averages	5.33	254	1.89	9.35

Apparently there is significantly less cutting of tubers in fields ridged high than in those approaching level culture. This difference is very likely due to the fact that high ridging results in tubers setting at a higher level than in the case of less ridging. No significant effect of height of ridge on tuber bruising is evident in this study. It cannot be assumed, therefore, that ridging as generally practiced results in more soil being carried over the digger at harvest time.

Digger Operation Related to Tuber Bruising

Following the results obtained in field studies made in 1931 (5) and in 1932 (3), a test, under controlled conditions, to determine more accurately the relation of digger operation to bruising was made at the Long Island Vegetable Research Farm at Riverhead. To provide ample power and facilities for varying the speed of the digger chain, a digger equipped with power-takeoff and hauled by a Farmall tractor was used. This made it possible to operate the digger chain at three different speeds with the digger set at two different depths at each speed. The potatoes to be dug in this test consisted of a fertilizer experiment laid out in four blocks, each with 50 foot rows. The data reported in each case represent the average of four 100-tuber samples one taken from each of the four blocks in the row. The relation of speed of digger chain with the digger set at different depths and equipped with extension elevator to percentage of bruised tubers is shown in table 4.

TABLE 4.—*Relation of digger operation to bruising of potato tubers. (Equipped with extension elevator).*

Chain Gear	Digger Set Ordinary Depth		Digger Set Deep		Average Bruised (per cent)
	R. P. M.*	Bruised (per cent)	R. P. M.*	Bruised (per cent)	
Low	7.2	4.25	7.2	0.75	2.50
Medium	14.4	13.00	12.0	3.75	8.38
High	19.2	16.00	14.4	3.25	9.63
Average	...	11.08	...	2.58	6.84

*Digger chain revolutions per minute

On the average, about one-fourth as many tubers were bruised with the digger chain operated in low gear (7.2 R.P.M.) as in high gear (14.4-19.2 R. P. M.) regardless of the depth at which the digger

was set. Likewise, about one-fourth as many tubers were injured with the digger set deep, to carry more soil, as with it set at ordinary depth. To this extent, it may be said that speed of operation and amount of soil moved are about equally effective in respect to tuber injury.

A similar test was made with the digger equipped with a continuous apron. The results are given in table 5.

TABLE 5.—*Relation of digger operation to bruising of potato tubers. (Equipped with continuous chain).*

Chain Gear	Digger Set Ordinary Depth		Digger Set Deep		Average Bruised (per cent)
	R. P. M.*	Bruised (per cent)	R. P. M.*	Bruised (per cent)	
Low	7.2	2.00	7.2	1.25	1.63
Medium	14.4	3.50	12.0	0.75	2.13
High	19.2	6.50	14.4	2.25	4.38
Average	...	4.00	...	1.42	2.71

*Digger chain revolutions per minute.

Although the effects of difference in chain speed and depth of digging with continuous apron equipment to bruising of tubers are not so marked as with the extension elevator, they are much the same. Important to note, however, is the fact that with the continuous chain the number of bruised tubers was, on the average, about 60 per cent less than with the rear elevator attachment. This is an even higher percentage difference than that found by the writer in the field studies of 1931 and 1932.

Conclusions

1. About 10 per cent of the potato crop grown in New York in 1931 and in 1932 was mechanically injured by the digger. Much of this is avoidable.

2. The standard makes of potato diggers in common use appear to be equally efficient in respect to tuber injury resulting from their operation.

3. About 85 per cent of the elevator diggers used in New York in 1931 and 1932 were equipped with rear attachments. The other 15 per cent equipped with a continuous apron resulted in 35 per cent less bruising of the tubers.

4. On 88 diggers equipped with rear attachment, the drop from

front to rear attachment ranged from 11 to 18 inches. For each increase of 2 inches in drop the number of bruised tubers increased 2.7 per cent.

5. The percentage of bruised tubers was found to be in inverse relation to the amount of soil carried on the digger chain.

6. The amount of soil carried on the digger chain was found to be in inverse relation to speed of operation and in direct relation to the depth of digging.

7. Height of row ridge on 254 farms varying from 2.5 to 9.0 inches seemed to bear no relation to tuber bruising. It is therefore assumed that ridging has no direct effect on the amount of soil carried by the digger. Increase in height of ridge was associated with a reduction in the percentage of cut tubers. This may be due to the fact that tubers set higher under ridge than under level culture.

8. A test of digger operation under controlled conditions demonstrated that reduced speed of the digger chain and deeper setting of the digger are equally effective in avoiding tuber injury. The digger equipped with a continuous elevator bruised about 60 per cent fewer tubers than when the same digger carried a rear elevator.

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MARKETING THE 1933 POTATO CROP IN NEW JERSEY

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In order to appreciate the results of the efforts to dispose of the 1933 New Jersey potato crop through a central office it is necessary to inquire into the system usually employed for marketing the crop. In the first place, there are four different groups of buyers in New Jersey. First, the outside buyer, usually a representative of the various chain store organizations. In most cases these men make their purchases

through the local dealers but they sometimes make direct purchases from the grower. Secondly, the local dealer, with an established place of business. Most of the potatoes in New Jersey are purchased by this class of buyer. These dealers usually sell fertilizer, seed potatoes and other agricultural supplies. Very frequently they serve in the capacity of bankers in that they advance credit to the grower for necessary supplies. Thirdly, the wholesale commission men who buy rather large quantities of potatoes during the season. In a number of cases they own their trucks and when, going to one of the larger markets for a load of produce, pick up a load of potatoes for disposal in the market. Fourthly, there is to be considered the itinerant trucker. In seasons such as 1932, when prices were ruinously low, they were particularly active. In years of this kind New Jersey is dependent to a large extent on local markets and when this condition exists the established dealer cannot compete with the itinerant trucker. Something must give and it is usually the price to the grower. In seasons such as 1933, when prices were high, the itinerant trucker was almost forced out of business.

With all of these buyers operating on the same market it is obviously impossible to maintain prices. There must be some way of regulating them. This has been attempted in New Jersey and the purpose of this report is to outline briefly what was done in order to accomplish this. It is doubtless true that the marketing situation in New Jersey is different from that existing in many other states. Most of the acreage is planted with the Irish Cobbler variety and most of the crop is marketed from the field. While our marketing season is usually short, this is not always the case; in 1932, for example, it was nearly twice as long as in 1933. Despite the fact, however, that our conditions are quite different from those in other sections there are certain features which we have in common. There is little question but that many of the difficulties experienced in marketing the crop in New Jersey are experienced elsewhere. It is safe to assume at least that New Jersey has one thing in common with most other potato growing sections; we have a marketing system that has cost the potato grower many thousands of dollars.

It is usually a customary procedure to make no changes in existing systems until the point is reached where the situation is so desperate that something must be done and done immediately if a samsh-up is to be avoided. This was the situation in New Jersey in 1932. Potatoes were selling for 75 cents per 100 pounds and rapidly going lower. The local dealers admitted there was no excuse for the falling market, ex-

cept their own inability to get together. We suffered from the universal complaint—each dealer, when his tracks became loaded with potatoes, found it necessary to cut prices in order to sell. This system is possibly in need of explanation. The dealer who finances a grower feels it to be absolutely necessary to accept all the potatoes the latter hauls to the loading station. He knows that if he does not another dealer will get them and in this way he may lose his chance to collect his outstanding bills. As the result, the dealer rarely, if ever, knows how many potatoes he will have on the track at the close of the day. This very often results in the loading of cars far in excess of market demands. Unfortunately, this fact is soon known to the outside buyer and he immediately begins to look for a drop in price. Usually it is unnecessary to look far, for some dealer is almost certain to cut prices —in anticipation of the fact that if he does not his competitor will.

This is what happened in 1932. This, together with competition with the itinerant trucker, nearly ruined the New Jersey potato grower. Due to unrestricted competition there was an almost daily price reduction until the price to the grower was such as to make it impossible for him to pay his bills. When this condition was reached a committee was appointed to work out ways and means of preventing further price declines. This committee worked with the dealers in an attempt to adopt a uniform price. Several attempts were made to do this but all of them failed. It should be said that it is our firm belief that the New Jersey dealers made an honest effort to improve the situation. There is little question in the minds of those acquainted with the facts that the fault lies not with the individual dealers, but with the system. When all efforts to stabilize prices through the dealers failed, the growers took the matter in their own hands and agreed not to sell for less than 75 cents a hundred for a period of three weeks.

The agreement went into effect on a Saturday and the growers received the 75 cents the following Monday. It is true that the dealers made but little profit during this period. They seemed to be willing to operate on a small margin of profit, however, since the higher price to the growers placed them in a position where they could pay a larger portion of what they owed the dealer.

The chief value of the 1932 experiment was the fact that it clearly demonstrated to dealer and grower alike that the marketing system, not only could, but should, be improved. As the direct result of this a committee of growers and dealers was appointed to draw up a plan for marketing the 1933 crop.

In drawing up the plan the chief thought was to accomplish the

desired ends without interfering too seriously with existing agencies. Sometimes in our efforts to better marketing conditions we attempt to do so by doing away with the old, established dealers. It was our position that the dealers served a useful purpose and that more could be accomplished by working through them than against them. In view of this fact all established dealers were invited to membership in a Central Sales Office. Each dealer was required to have a representative in this office at all times when sales were being made.

As sales were made they were turned over to the office manager who in turn pro-rated them among the various dealers on the basis of his loadings for that day. This meant, of course, that in one day a dealer may have sold 25 cars but shipped only 15 cars. When the dealer members of the Central Sales Office were notified of the number of cars they were to ship, with their points of destination, the Central Sales Office was finished with that particular deal. The dealer was responsible for loading and billing as well as all collections and necessary adjustments. He in turn paid the loader of the cars in question.

Prices were fixed by a quotation committee consisting of seven growers and six dealers. Before any change in price could be made it was necessary to consult with the quotation committee and there could be no change without a majority vote of the farmer members of the committee.

The dealers were paid 5 cents per hundred pound sack for selling the crop. Of this amount, one cent was paid toward the maintenance of the central office. This proved to be ample to defray all costs and leave a balance at the close of the season. It may be suggested by some that four cents is too little for handling a sack of potatoes. It must be pointed out, however, that this price was agreed upon in the early spring when it was anticipated that potatoes would sell for approximately $1.00 a hundred. When the season opened and the prices were more than twice the anticipated price it was decided not to change the agreed upon price since it was felt that this might cause some dissension in the growers' ranks.

The growers were asked to sign an agreement to the effect that they would sell their crop only to those dealers who joined the Central Sales Office. In the case of truckers or any other buyer not represented, it was agreed that the grower would not make direct sales but would refer this type of buyer to the nearest dealer represented in the Central Sales Office. The grower likewise agreed to discontinue his digging operations when advised to do so by the grower-dealer com-

mittee. This was considered to be necessary to prevent loading more potatoes than the market would stand. For most part the growers lived up to the agreement. It is true that some dug when they shouldn't and others sold to buyers outside the organization. In general, however, the original plan was followed by a very large majority of the growers.

The Central Sales Office was in operation for approximately 10 weeks and during this time sold 4,529 cars of first size potatoes. The total sales for all potatoes handled by the office amounted to approximately three million dollars. It is difficult to estimate just what this meant to the New Jersey potato growers; some have suggested that it resulted in an average increase of approximately 50 cents a sack. All are agreed, however, that the effort was worth while and growers and dealers alike feel the necessity of continuing the organization another years. Some have suggested that the plan worked as the result of naturally high prices. There may be something in this. It is safe to say, however, that it is more difficult to regulate digging operations when prices are high than when they are low. In the former case the grower feels that they may soon be lower while when low prices prevail he hopes that they will be higher and consequently is less anxious to dig.

Most of the New Jersey dealers and growers believe that the marketing organization was worth while. They are convinced that a satisfactory marketing system will do more toward placing the potato industry on a paying basis than any other one factor.

THE FLESH COLOR OF THE POTATO

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The flesh color of the potato plays a most significant part in its evaluation in the various states as well as in particular sections of these states. In most parts of Germany a yellow fleshed potato of the "Industry" type is absolutely demanded for human consumption. In certain regions, limited for example to the poor sand regions of the province of Brandenburg, the people demand white fleshed, mealy potatoes, of the *Magnum bonum* type, (the European, not North American *Magnum bonum*). As a matter of fact, everywhere in Germany early potatoes should have yellow, firm flesh and should correspond approximately to the type *Juli* (*Paulsen's*). In only a few localities is

the *Early Puritan* type marketable, and then always at a greatly reduced price.

The extent to which the Germans are interested in yellow fleshed potatoes, and how much potato breeders are concerned in the creation of new varieties of better quality and productiveness is apparent from the fact that we now have 68 recognizedly yellow fleshed varieties.

Contrasted with this large number of yellow fleshed varieties there are twenty-eight light yellow fleshed types. This is mainly due to the fact that German breeders eliminate, in the course of their breeding work, novelties that are not really yellow fleshed, not submitting them to the state comparison-tests, nor for the market. Among the previously named yellow fleshed varieties, the greater part are of very recent date, having come on the market in the course of the last few years. Ten years ago Modrow's "Industry" was the only popular yellow fleshed variety and it is today the most sought after variety in the land. Twelve of these varieties are daughters of "Industry," while eight others are its granddaughters. One notices that breeders, in Germany, lay the greatest emphasis on the production of wart resistant, yellow fleshed potatoes. The goal desired is a wart resistant "Industry" of increased productivity, and breeders seem to be approaching this goal.

The distinguishing features of these many varieties are naturally not so great that the potato-consumptive trade and the city consumer in all instances differentiate among them. For practical purposes many of these varieties are placed in groups, as is also the case in America. These groups are designated under the names of the well known older varieties, especially as "Industry" types. There is not, in Germany, an official grouping, as in America. The farmer and the authorities in charge of the registration of potato varieties, however, always differentiate sharply among particular varieties, since though of the same constitution for purposes of consumption, they differ markedly both biologically and economically and, therefore, are necessary for the manifold climatic and soil conditions prevailing in Germany.

The price difference between white fleshed and yellow fleshed potatoes in Berlin on October 16, 1933, was 12 cents per hundredweight, the price of the former being 36 cents per hundredweight. Considering that this price scarcely covers cost of production the increase is worth greater efforts.

German-Austria and Esthonia seem also to prefer yellow fleshed potatoes while the neighboring Lettland has always shown a preference for white potatoes. In Poland and the Scandinavian countries one

finds white varieties predominating, especially in the older catalogues of varieties; the newer catalogues, however, often recommend the "Industry" type. England and America on the other hand apparently prefer the white fleshed varieties, in fact, cooked potatoes must be snow white.

As a result of the above preferences in color, the task of the potato breeder is to produce the flesh color the consumer desires and to constantly try to improve this color. Even though flesh color can be influenced within certain limits by environment, the weather, fertilizer, and health conditions of the plants, etc., it is nevertheless determined in the first place by inheritance. For this reason it is necessary for the breeder to know which varieties, or seedlings raised especially for breeding material—as in inbred seedlings in which flesh color was the primary reason for their selection and in which the color was extraordinarily pure—pass on either the yellow or snow white flesh color with relative certainty to a numerous progeny and can as a result of their generative fertility, be used advantageously. Their pollen must be as viable as possible, for if there is a lack of pollen parents, all of the breeders' efforts are in vain. Most varieties with very fertile pollen will develop seedballs; never, however, does this occur inversely. Furthermore a prerequisite for successful breeding is a knowledge of the genetic factors which are to be emphasized, in this instance, a knowledge of the genetics of flesh color. In connection with the regularity of inheritance of the individual varieties, as with the inheritance of flesh color there is much still unexplained and insufficiently investigated.

Papers analyzing inheritance in respect to flesh color are few in number and deal only with European and North American material. The author has tried by a small series of crosses to introduce the flesh color factors of the Peruvian Andean potatoes into the field of investigation. Inheritance factors of these are doubtless also contained in the European-North American cultivated varieties. So far as we know from existing carefully prepared papers dealing with the analysis of inheritance, the flesh color of the European-North American cultivated varieties is determined by one pair of factors, whereby homozygotes of the dominant factor should give yellow flesh, and the recessive factor should give white; the more or less light yellow fleshed varieties are regarded as heterozygotes. As a result, the inbred seedlings of so-called white fleshed potato varieties very often produce yellow fleshed seedlings and the white of the flesh is very different within single varieties. There must, therefore, be more factors determining flesh color. The author's series of crossings of Jubel (Richter) as seed parent and

three Peruvian clones, differing sharply from each other, as pollen parents, offers some supporting evidence. *Jubel* is white fleshed, but its flesh is not what one designates as snow white. Of the Peruvian varieties used, two were white fleshed while the third was a regular yellow fleshed variety. The latter, (San Gregorio) produced a large per cent of yellow fleshed seedlings. The two white fleshed; one a clone of the Peruvian variety, Pucaniana, (Red Maiden) a very variable variety produced a considerable number of seedlings with snow white flesh; the other, only normal not quite pure yellow and white flesh color. These results are especially interesting in that the two Peruvian varieties were chosen, not with respect to their flesh color, but for their skin and blossom color. It was, therefore, a chance coincidence, hence one must assume, that the enumerated valuable inheritance-characteristics (along with a number of others which here cannot be further investigated) must be widespread in those local forms. This would seem to be a worth while field in which to seek promising inheritance characters.

The two named Peruvian varieties came from the north Peruvian Department of Ancash, and were graciously placed at our disposal along with many others, by S. P. Vallejo, Agricultural Engineer, and head of the Agronomic Commission of Ancash, Huaras. Unfortunately all the local names of the varieties are of a purely descriptive character, chiefly relating to the peculiarities of the tubers. One cannot know, therefore, what inheritance factors one receives with such material. If one desired, the varietal names might be used as a basis for classification as the multiplicity of forms is very large.

The large collection of the Institute for Plant Research in Muncheberg, near Berlin, or that of the Russian Institute for Plant Research in Leningrad show this variability, as does also, in a lesser degree, the collection of the author.

In contemplating this multiplicity of forms and the series of crossings mentioned, one becomes convinced that the one pair of factors which the hitherto undertaken inheritance analyses have shown to exist, is not sufficient to account for the various forms which have appeared. In the author's opinion, at least, one more yellow factor must be assumed and one factor for the occurrence of the grayish green undesired color for the species *Solanum tuberosum*. The latter factor is present in a large part of the Peruvian varieties and causes the undesirable grayish white and greenish yellow flesh colors. It is to be surmised that it is also responsible for the color of the European varieties, which are unfortunately not always snow white. On the other hand, a second

yellow factor must be present, which causes the intensively yellow flesh colors, for example, of the Peruvian variety Naranjito (Little Orange), as also of the high Andean Lucci forms which apparently are equivalent to the culture species—Ajanhuiri—Juz. et. Buk.—determined by the Russians.

Unfortunately one is not sufficiently clear as to the nature and mutual influence of the pigment factors which cause the coloration of the potato flesh. So far as one knows now, the coloration of the flesh of the potato is caused by flavonoles. These are phenylbenzopyrones which are insoluble in water and in petrolether but are soluble in the cell sap. With a normal KOH solution (according to Prof. Klapp of Jena) sliced raw potatoes show characteristic increased yellow coloration, which facilitates the differentiation of the colors of the potato flesh. There are a great number of different flavonoles which produce colors from light yellow to golden red. In this respect, nothing should stand in the way of the differentiation of the flesh colors chemically. Unfortunately, the chemistry of the coloration of the potato has by no means been sufficiently studied. As in the case of most plants, one has been interested in the potato always in its economically important substances, such as starch, protein, sugar, and the numerous other chemical compounds of the plant body, to which one must logically attribute also any function in the organism—be it as agents or as end-products of the change of matter, these are neglected. It would indeed be a worthy task to clear up the chemistry of the whole potato plant, and certain functions of this most important food plant of the white race, to explain the separate parts of the plant and their stages of development. One would expect that from such a study, much that is valuable and worth knowing could be made available to the potato breeder.

CERTIFIED SEED POTATOES IN PENNSYLVANIA

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An effort was made in past years by the Potato Association of America through its committee on certification to have the various states adopt uniform inspection standards. William H. Martin has been an outstanding leader in this movement. A glance over the accompanying tables would indicate that the efforts along this line have met with considerable success. In the certification committee's report for 1925 there were seven states out of eighteen reporting which permitted a total of eight per cent or more of disease at the first field inspection. Out of twenty-three states included in tables 1 and 2 only

TABLE I

1934 *Inspection Standards—First Field Inspection*

State	Mosaic	Curly Dwarf	Leaf Roll	Spindle Tuber	Yellow Dwarf	Giant Hill	Streak	All Comb.	Black Leg	Wilt	Rhiz.	Weak Plants	Var. Mix.	Total Diseases	Isolation
Cal.	5	5	5	(or any other virous disease)				5	5	5	5	5	5	10	300
Col.	3		3	2	(Spinach leaf 1%)			4	1	2				5	300
Idaho	3		3	3		3			3			10	2	3	300
Md.	3		2	2	0.5			5	2	2			1	6	200′ from 10% dis. pl.
Mich.	1	1	1	1	1/8	1			1	1		3	0.25	2	300
Minn.	4		4	1	3		3	3	2	2		3	2	5	165
Maine	3		2	2	0.5			5	2	2			1	6	250
Mont.	(3% of any degeneration disease)							5	1	2		2	1	6	200
Ky.	4		4	2				6	3	2			1	7	100
Neb.				1.5	(other virous diseases 2%)			2	2	(wilt-serious infection)			0.25		75
N. H.	5		3	1				5	1			5	1		200
N. J.	3		3	2	0.5			5	2	2			1	6	200′ from 10% dis. pl.
N. Y.	2		2	1.5	0.5			3	1	2			1	6	Graduated
N. C.	1	1	1	1		1			1	1	5	1	0.5	2	none
N. D.	2		1	1		0.5		3	2	2		3	1	4	165
Ohio	2		2	1	0.5			3	1	1			1	5	200′ from 5% dis. pl.
Ore.	5		2	5		5		5	2	2		5		10	300
Pa.	3		4			3			2	2				5	150
S. D.	3	3	3	3				5	1	2		3	1		300
Vt.	3		3	2	0.5			5	2	2			1	6	200′ from 10% dis. pl.
Wash. ...	4		2	1				5	2	2			0.5		300
Wis.	(Virous maladies above 4% cause for rejection. Other figures not given)														
Wyo.	3			3	(other virous diseases 3%)			3	2	2			2	5	200
Canada ..	2		2	2					2	2			1	6	200

TABLE II

1934 *Inspection Standards—Final Field Inspection*

State	Mosaic	Curly Dwarf	Leaf Roll	Spindle Tuber	Yellow Dwarf	Streak	Giant Hill	All Virous Comb.	Black Leg	Wilt	Rhiz.	Weak Plants	Var. Mix.	Total Diseases
Cal.	5	5	5	(and other)				5	2	2	2			9
Col.	2		1	1 (Spinach Leaf T)			T	3	T	1				4
Idaho	2		2	2			2	2	1	4				
Md.	1		1	1	0.5		1	3	1	1			0.25	4
Mich.	0	0.5	0.5	0.5	1/8		0.5		0.5	0.5		0.5	0	1
Minn.			3	1	1	1		3	1	1			0	3
Maine	2		1	2	0.5		1	3	1	1			0.25	4
Mont.	(3% of any degeneration disease)							4	1	1		2	0.25	5
Ky.	2		2	1				3	1	1			0.5	4
Neb.				1 (other-virous-diseases 1.5%)				1.5	1.0	5			0	
N. H.	Total diseases allowed—15 plants per 1,000 ft. of row.													
N. J.	2		1	1	0.5		1	3	1	1			0.25	4
N. Y.	0.5		0.5	0.5	0.5			2	1	1			0.25	4
N. C.	No second plant inspection													
N. D.	1		0.5	1			0.25	1	0.5					1.5
Ohio	1		0.5	0.5	0.5		1	1.5	0.5	0.5			0.25	2.5
Ore.	5		2	5			5	5	2	2		5	T	10
Pa.	2		2				2		2	2				2
S. D.	1	1	1	1				2	1	1		2	0.25	
Vt.	2		1	1	5		1	3	1	1			0.25	4
Wash.	2		1	1			1	3	1	1			0.25	
Wis.	No figures given													
Wyo.	3			2 (any other virous diseases 2%)			2		1	2			T	4
Canada	1		1	1					1	1			0	3

two permit a total disease tolerance of more than eight per cent. This would indicate that the number of states certifying potatoes have lowered their disease tolerance in accordance with the recommendations of the committee on certification.

The adequate training of inspectors in the various states was also one of the aims of this committee. Undoubtedly in the early years of the certification work, a number of the inspectors failed to interpret the standards and apply them in the manner in which it was intended they should be applied. This resulted in the certification of a considerable amount of seed which failed to give satisfactory results. The certified seed that has been received in Pennsylvania during the past several years has been of a very uniform quality compared to the stock received eight or ten years ago. Each year we import several hundred thousand bushels of seed from other states. A few lots have been brought in that failed to prove satisfactory but this seed as a whole has been quite uniform in quality and generally gave very satisfactory results.

The tightening up of the certification standards and the additional training of the inspectors through the regional inspectors' conferences has resulted in an improvement in the quality of the seed. Unless an inspector has the proper conception of what to look for when he is making an inspection, we cannot hope that he will apply the standards in a way which will result in a satisfactory quality of seed regardless of whether the standard is a rigid one or liberal in its tolerances. From our experiences in the past and the results secured through these inspectors' conferences, it would appear that we might well consider holding another such conference within the next year or two.

Another question which needs further attention is the use of the term "certified" when applied to the sale of seed potatoes. Several states have taken action to protect the term but in many of the states its use is unlimited. The law under which we operate in Pennsylvania prohibits the use of the word "certified" or any similar term in connection with the sale of seed potatoes, agricultural and vegetable seeds, except as provided in the following requirements which were just recently promulgated.

RULES AND REGULATIONS GOVERNING THE SALE OF CERTIFIED SEED POTATOES, AGRICULTURAL AND VEGETABLE SEEDS IN PENNSYLVANIA

EFFECTIVE JULY 2, 1934

Certified seed will be eligible for sale in Pennsylvania in accordance with the following requirements:

1. Agencies recognized by this department as being the legally

constituted authorities responsible for the administration of the seed certification work in the several states mentioned are attached hereto.

2. Certification standards must have been issued or authorized by an agency herein recognized as the official certification authority in the state where the seed was grown.

3. Seed potatoes, agricultural or vegetable seeds to be sold as certified must have passed all field and grade inspections as prescribed in the certification rules and regulations adopted by this department or by the recognized agency in the state where grown.

4. No seed potatoes, agricultural or vegetable seeds shall be recognized as certified which have been inspected under standards compiled by any commercial or cooperative sales organization unless such seed was inspected as herein provided and which carries the certification tag issued by the recognized agency in the state in which such seed was grown.

5. Seed potatoes, agricultural and vegetable seeds that carry the official certification tag of the recognized agency will be considered as having been properly certified when such tags were attached to the seed in accordance with requirements set forth in the certification standards in force in the state in which the seed potatoes, agricultural and vegetable seeds were grown.

6. Each and every bag, package or other container of certified seed potatoes, agricultural or vegetable seed sold, shipped or otherwise brought into Pennsylvania from points outside the state shall bear a tag or such other identifying device as may be designated by this department or by such other recognized authority responsible for the administration of the certification service in the state where the seed potatoes, agricultural or vegetable seeds were grown.

Agencies recognized by this department as being the legally constituted authorities responsible for the administration of the seed certification work in the various states and Canada are as follows:

California	Department of Agriculture	H .W. Poulsen	Sacramento
Canada	Dominion Department of Agriculture. Covers entire Dominion, including Prince Edward Island, Nova Scotia, New Brunswick, Quebec, Ontario, Manitoba, Saskatchewan, Alberta and British Columbia	John Tucker	Ottawa
Colorado	College of Agriculture	C. H. Metzger	Fort Collins
Idaho	College of Agriculture	E. R. Bennett	Boise
Kentucky	College of Agriculture in cooperation with Seed Improvement Association	John S. Gardner	Lexington

Maine	Department of Agriculture	E. L. Newdick	Augusta
Maryland	Maryland Seed Certification Board	R. A. Jehle	College Park
Michigan	Michigan State College in cooperation with Michigan Crop Improvement Association	H. C. Moore	East Lansing
Minnesota	Department of Agriculture	A. G. Tolass	St. Paul
Montana	Montana State College in cooperation with Potato Improvement Association	E. E. Isaac	Bozeman
Nebraska	College of Agriculture in cooperation with Nebraska Certified Potato Growers'	Marx Koehnke	Alliance
New Hampshire	Agricultural Experiment Station	O. Butler	Durham
New Jersey	Department of Agriculture in cooperation with New Jersey Potato Association	Paul B. Mott	Trenton
New York	New York State College of Agriculture in cooperation with New York Seed Improvement Association Incorporated	K. H. Fernow	Ithaca
North Carolina	College of Agriculture in cooperation with North Carolina Crop Improvement Association	W. H. Derst	Raleigh
North Dakota	Seed Department	E. M. Gillig	Fargo
Ohio	College of Agriculture in cooperation with Ohio Certified Seed Potato Growers Association	E. B. Tussing	Columbus
Oregon	State Agricultural College	E. R. Jackman	Corvallis
Pennsylvania	Department of Agriculture	K. W. Lauer	Harrisburg
South Dakota	South Dakota State College in cooperation with South Dakota Potato Growers' Association	K. H. Klages	Brookings
Vermont	Department of Agriculture	H. L. Bailey	Montpelier
Washington	Department of Agriculture	Charles D. Gaines	Olympia
Wisconsin	College of Agriculture	J. O. Milward	Madison
Wyoming	College of Agriculture	Glen Hartman	Laramie

SECTIONAL NOTES

ARKANSAS

Potato shipments from Arkansas are practically over for the season. Total shipments to date this year are 678 cars compared with 577 cars last year. Reports indicate fairly heavy holdings on farms for local sales and second crop planting. Few additional shipments are expected since the Kaw Valley-Orrick district is opening although shipments from this section have been light to date. This fact has allowed shipments at least one week longer out of Arkansas. Heavier movement by truck appears to have occurred in the Fort Smith area than in the past. Part of this increase has been due to dry weather cutting down on the supplies of beans, cucumbers and tomatoes usually moving from this section at this time.

Both 4-H Club members and F. F. A. members have moved potatoes as groups this year. While the percentage of total shipments moved by these groups is small, they have indirectly served to improve the returns at several shipping points.

The Charleston group, operating on a selective membership basis, has again demonstrated the value of proper methods of production, harvesting and carlot marketing. This group has secured a premium of around 20 cents per hundred net over prices prevailing at nearby shipping points.

Unusually heavy grub injury, considerable scab, together with average handling during hot weather which resulted in heavy sunscald loss, have been some of the unfavorable factors this season. (July 11).—WILLIAM G. AMSTEIN.

CALIFORNIA

At the present rate of movement all the Shafter district of California will be practically out the way by July 23.

The movement in June this year was not so heavy as last year, whereas the quantity of potatoes on hand June 1 this year was about the same as last year, so these potatoes are lasting longer for a longer period of time than last year.

The Los Angeles crop has developed just about the same as usual and will supply the requirements of the Southern portion of the state for the next thirty days.

The Stockton crop is developing nicely. There have been no unusual climatic conditions except that there have been more extremes this year than last year. It has been both hotter and colder. These extremes may effect the total yields, but it is almost impossible to pre-

dict their effect at the present time. The Stockton potatoes will be able to take the market in the Northern part of the state as soon as Shafter is through, and take care of Los Angeles requirements as soon as their local crop is exhausted. There is no reason why the potatoes in California cannot be marketed orderly and they probably will be. (July 9).—H. G. ZUCKERMAN.

COLORADO

The potato situation in Colorado is becoming more unfavorable as the supplies of irrigation water become exhausted. The winter moisture stored in the soil is now depleted and many crops are now suffering from lack of moisture. A great many irrigation wells are being put in, especially in the San Luis Valley. Pumps will supply enough water from these wells to make a potato crop. Cooler weather and local showers have been of some assistance since the first of the month. Where irrigation water is scarce other crops are being abandoned and all efforts are concentrated on potatoes and sugar beets which are the cash crops throughout most of the state.

Psyllids were very numerous in the early producing districts but timely spraying with lime sulphur insured a good crop. These insects are now appearing in some of the main crop districts and growers have already started spraying.

Our field inspections for certification are starting and we should have a very accurate picture of the situation by this time in August. (July 9).—C. H. METZGER.

Although the Greeley district has been short of irrigation water, the potato crop is in fair to good condition at the present time. Heavy rains occurred throughout the district on the 15th and 16th of June. One-half inch of rain fell June 20, and .49 of an inch on July 4.

Some growers will start harvesting their early crop this week, but most fields will not be ready for digging for ten days to two weeks Early Ohios and Cobblers will be harvested first with Triumphs maturing about two weeks later.

Spraying for psyllid yellows, with lime-sulphur appears to have given good results with the early crop. A large proportion of the early acreage has been sprayed for psyllid yellows this year. (July 9).—W. C. EDMUNDSON.

INDIANA

Owing to the continued hot and dry weather the early and intermediate potato crops are suffering considerably—not only from the weather but from the flea beetle and leafhopper. It now appears as

if the yield of the early potatoes will be cut at least in half of the expected.

The late potatoes are being planted at this time. Those that are up are looking very good. The late potato grower is more or less a commercial grower and is spraying or dusting to control the pests. I presume our acreage has increased considerably over the expected, although the final figures will not be available until some time later. (July 2).—W. B. WARD.

MAINE

Growing conditions in Maine have been quite favorable thus far. The crops were delayed in the early season by cold weather and excessive moisture but the weather of the last two weeks has resulted in much improvement. There has been less loss from erosion and from drowning than usual to date.

The season has been even more favorable for legumes, hay and grains. Farmers are cutting one of the best hay crops in history. Much of the clover hay is being left in the ground to plow under, thereby increasing the fertility of the soil for the coming potato crop.

Spraying has been delayed by the majority of growers due to the recommendations of the Experiment Station and Extension Service. They are advising farmers to start the week of July 16 so probably spraying operations will be in full swing that week.

Due to the excessive snows of last winter affording protection to insects that overwinter in the top layers of soil, there is a much greater infestation of Colorado potato beetles, aphids and other pests than usual. We look for considerable difficulty from aphids a little later in the season.

There has been an increase of 4,500 acres in the applications for certification. As to whether there will be the normal percentage of rejections in the field inspection, it is now difficult to determine. Not enough evidence has been shown as yet as to the spread of virous diseases last season with its consequent effect on the growing crop this year.—FRANK W. HUSSEY.

MASSACHUSETTS

Continued favorable weather conditions in Massachusetts since planting, with rainfall slightly above normal for June, give promise of satisfactory yields for the potato crops.

Flea beetles, however, have been more troublesome than usual in most early planted crops. Considerable injury by them to leaves un-

doubtedly is a contributing cause of some early plantings now showing the first signs of maturing vines on cobblers. Later plantings have largely escaped their depredations. Preliminary trials with various rotenone spray and dust products, give some indications of favorable control of this insect through their use.

Migration of leafhoppers from harvested mowings to neighboring potato fields is now occurring, and will require thorough spraying on the part of growers to combat this most serious midseason pest.

Considerable infestation by aphids, owing to a recent dry period, is now apparent on vines. Some tip burn, also, is observable following some high temperature readings.

Several areas of severe damage to plants, apparently due to magnesium deficiency, have recently been observed in the Connecticut Valley section on light acid soils. (July 14).—RALPH W. DONALDSON.

NEW JERSEY

Lack of rainfall together with unusually high temperature during the first two weeks of July resulted in considerable injury to the New Jersey potato crop. Some growers have estimated that the yield was cut as much as 25 per cent. While it is impossible to state definitely how much the crop was injured, there is no doubt that the total production will be less than had been anticipated earlier in the season. A few potatoes are being dug for local markets but it is very doubtful if there will be a very large movement before the last of July.

The central sales office, made up of all the dealers in Central Jersey, is now assured. At the present writing, approximately 80 per cent of the total acreage in Central Jersey has been signed up to be sold through the central offices to be established at Freehold and Hightstown. While there are to be two offices, there will be one quotation committee to ensure that one price is quoted from each. The South Jersey growers will not sell through the central office but will make a special effort to see that the Central Jersey price is maintained. (July 16).—W. H. MARTIN.

NEW YORK

Growth conditions throughout the state were much improved by June 15. Most sections of western and northern New York have had local showers sufficient to promote growth although more water is needed. This year the Colorado beetle has been active in all areas whereas last year it was difficult to find slugs in western New York. In northern New York germination was retarded because of delayed

planting caused by drought. The size of the crop will depend on growth conditions from now on.

Some of the earliest planted Cobblers on Long Island are being dug and even though the tops are green, the yield is 75 to 90 barrels to the acre. There is a feeling among Long Island growers that prices later on may be low because of the large crop in prospect in New Jersey, Maryland and Virginia. Whereas last year there was very little overlapping in marketing season among these early potato sections, this year it is likely that the opposite condition will prevail. Profitable price levels may be maintained only by a strong effort toward orderly marketing.

Plans are now completed for the annual potato field day of the Empire State Potato Club at the farm of H. L. Hodnett at Fillmore, New York, on August 9. From 3000 to 5000 growers from this and other states are expected to attend. (July 9).—E. V. HARDENBURG.

LONG ISLAND

Cobbler vines are ripening and turning yellow fast. The exceptionally hot, dry spell of late June and early July undoubtedly caused injury to the potato crop. Green Mountain vines are still green and growing, though some fields show injury from aphids, flea beetles, leafhoppers and the hot weather. So far this season, late blight has not been a factor. Cobbler digging has started in a small way on the eastern part of the North Fork and the western end of the Island. To date, however, the movement has been very light. Because of late planting, hot, dry weather, and the heavy insect infestation, yields will probably not average so high as the previous two seasons. The quality of the crop is expected to be excellent. (July 14).—W. G. BEEN.

OHIO

Drouth conditions have been relieved somewhat by local thunder showers but the state is still short of rain for the year. A few areas in the state have received very little rain. The weather has been extremely warm and the early crop of potatoes has a light set with considerable second growth. The early crop will be short.

The late crop was planted late because of the hot, dry condition of the soil. In the northern section of the state, about half of the acreage was not planted until after the middle of June. Soil that was plowed early was so dry that planting was impossible until after rains, which started about the middle of June.

The acreage in Ohio for this year is estimated at 106,000 acres as

compared with 112,000 for last year. The condition of the crop at this time is above that of last year but under the ten-year average for July.

The wind and drouth caused considerable damage to the onion acreage on the muck. Some of the muck planted to onions that either blew out or had poor growth because of dry weather, was later planted to potatoes. The Katahdin yielded well on the muck last year and many growers have planted part of their acreage with this variety. (July 16).—E. B. Tussing.

PENNSYLVANIA

On July 12, potato conditions in southeastern Pennsylvania were very good. The acreage of Cobblers is probably larger than ever before. While early potatoes have no doubt been hurt by the extreme heat of the last several weeks, moisture has been generally adequate in the eastern sections, so that good yields may be expected. Early planted Cobblers, which have not been sprayed, are turning rapidly. Sprayed fields are holding up fairly well.

In central and western Pennsylvania, potato conditions depend on local moisture supplies which are very spotted. Even where good showers and more or less general rains have fallen, the lower soil is so dry that surface moisture is very quickly lost. The early crop in the western part of the state is generally much reduced and the late crop, while not seriously hurt, will have to receive frequent and generous rains if it is to be much of a success.

Stands, in general, seem good except where cut seed was planted in hot, dry soil without sufficient covering. (July 14).—J. B. R. Dickey.

SOUTH CAROLINA

The total movement from South Carolina is approximately 3400 cars. With the low prices received, the season was not so satisfactory to our producers. The average yields were fairly good, but unfavorable weather during the shipping season injured the quality of the late potatoes to a considerable degree. (July 9).—George E. Prince.

NORTH DAKOTA

Our acreage is somewhat larger than last year but is more than offset by decrease in stand. We had extremely hot weather during the latter part of May together with unusually dry soil conditions which

resulted in much of the seed being injured in the ground. As a result stands of 50% to 60% are common. Unless we have more than usually favorable growing weather the poor stands will more than offset the increased acreage.

The quality of seed planted in North Dakota this year is superior to seed which has been planted in any previous year, insofar as freedom from disease is concerned. (July 11).—E. J. TAINTOR.

VIRGINIA

Beginning Monday, July 16, it is the consensus of opinion that the Eastern Shore of Virginia will not have more than 4500 cars of white potatoes, and possibly less, to ship.

The yield in the big central part of the Peninsula, including the territory from Eastville to Bloxom, is not especially heavy due to the loss from drowning last spring and to drought and heat conditions during the last two or three weeks. Likewise, the upper end of the Eastern Shore of Virginia Peninsula which does have a good stand of potatoes is yielding much below expectations. It would appear that the yield in Accomack County would not exceed 40 barrels to the acre. The early producing section of the Peninsula, namely, from Eastville to Kiptopeake, has largely harvested a very fine crop with a very good yield. Probably this Peninsula will yield around 13,000 cars this year —possibly a little less.

The yield on the Eastern Shore of Maryland will be very light. It is estimated that 1500 cars remain to be moved after Monday, July 16. The entire crop on the Eastern Shore of Virginia and Maryland probably will be harvested in about three weeks' time.

As may have been noted from press reports, the northern half of North Carolina, the Norfolk area, the Eastern Shore of Virginia and the Eastern Shore of Maryland have signed the AAA marketing agreement. The basic feature of this agreement is limitation of tonnage which may be shipped during the season and a pro-ration of shipments during the shipping season to regulate movement to meet market demands. It is understood that the area from Florida up to the first mentioned area in North Carolina will likewise come into the agreement this summer, and the likelihood is that at least part of the early producing region from Kansas to Texas will develop a similar agreement. The general supposition is that much may be done to secure the proper production through allotments of acreage to individual farmers through a cooperative effort. (July 14).—G. S. RALSTON.

WISCONSIN

Potato demonstrations conducted by the Extension Service in Wisconsin will be located this season under widely varying conditions in three potato belts, namely (1) the truck growing area of southeastern Wisconsin; (2) the old central Wisconsin potato belt (mainly sandy soil area); (3) the newer counties of upper Wisconsin.

Comprehensive tests of new varieties of potatoes have been located in all three of these areas. Arrangements have been made with growers to make comparative tests of Department of Agriculture seedlings, the Katahdin, the Chippewa and the Golden. These varieties are being planted to comprise comparative tests with the standard varieties raised in these areas. A considerable increase of the Katahdin variety will especially be obtained in 1934.

The Wisconsin Potato Field Day Site in Rice Lake in Barron County involving a tract of about twenty acres will be operated again in 1934. Special attention is being given to work with green manuring crops and tillage demonstrations. The area has been laid out into sections providing comparisons with the common types of tillage methods with the more recent operations involving deep tillage tools. The potato areas were planted around June 10 to June 17. Conditions at the present time are ideal in the Rice Lake area. The work for the past two seasons has been severely handicapped due to extremes of drought and heat. The Wisconsin Experiment Station is also conducting a field project located at Almond, Portage County, in the old central Wisconsin potato belt A special study is being made on degeneration diseases. The plots at Almond comprise seed stocks from widely separated sections of the state. Crop conditions are very satisfactory in Wisconsin at the present time.

The Experiment Station has completed a revision of potato certification plans. The inspectors will be in the field about July 15. (July 11).—J. G. MILWARD.

THE PRICE SITUATION

The following report on potatoes was released on July 16 by the Bureau of Agricultural Economics of the United States Department of Agriculture.

Market prices of 1934 crop potatoes declined almost steadily during June as shipments from the second early and intermediate states became heavy. Estimated production in the intermediate group of states is about 29 per cent larger than in 1933 and in the late states

4 per cent larger. Consequently prices may continue their downward trend until late fall but the decline may not be more than the usual seasonal decline. The large supply of early and intermediate potatoes has tended to force prices downward earlier than usual.

Potato prices at New York averaged $1.18 per 100 pounds during the first week of July compared with $1.59 the first week of June and $2.68 a year ago. At Chicago they averaged $1.55 against $1.65 a month earlier and $2.75 a year ago. Shipping point prices followed much the same trend as market prices; those at Washington, N. C., dropping from $1.21 to $1.02 per 100 pounds during the month of June whereas those at Pocomoke City, Maryland, declined from $1.52 on June 9 to 84 cents on July 6. The United States farm prices of potatoes averaged 64.4 cents per bushel on June 15 compared with 73.7 cents on May 15; 49.4 cents on June 15, 1933, and 71.8 cents the 1910-1914 June average. For the 1933-'34 crop season United States farm prices averaged 84 cents per bushel or slightly more than double those of the 1932-'33 season and the highest since the 1930-'31 season. The higher farm prices during the past season were due largely to the scarcity of late crop potatoes in New York and the North Central States.

The United States acreage of potatoes for harvest this season is estimated at 3,383,000 acres or 5.8 per cent larger than that of a year ago. July 1 conditions indicate that yields may average only slightly above those of 1933 and that the production will probably total 348,000,000 bushels. This production would be about 28,000,000 bushels greater than in 1933 but 17,500,000 bushels less than the 1927-1931 average. The crop in the 30 late states is expected to exceed the 1933 crop by 10,600,000 bushels with the crop smaller in the West but larger in the Central and Eastern States. Production in the intermediate states is about 8,300,000 bushels greater than the short crop of 1933, and in the early states about 8,800,000 bushels greater.

Shipments of potatoes from the second early and intermediate states, the principal shipping sections at this time, have been unusually heavy during recent weeks. The total movement of 1934 crop potatoes has averaged well above 5000 cars per week compared with only about 4000 cars per week in 1933. The total movement to June 30 of this year's potatoes is close to 38,000 cars against slightly more than 31,000 cars last year. Shipments of 1933 crop potatoes have about ceased, only a few from Maine, Michigan and Wisconsin are still moving.

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NATIONAL PLANNING NECESSARY

In the March issue of the JOURNAL we stated that "with present intention to plant and favorable growing conditions there can be only one outcome—low prices." It is possible that those states producing late potatoes may secure a fair price for their crop but the season has been a disastrous one for the growers in North Carolina, Virginia, Maryland and other states. At the present time also the Long Island and New Jersey growers are not receiving enough for the crop to pay their seed and fertilizer bills. If the Kansas and Missouri crops had not been seriously damaged by the drought the situation would have been still worse.

It is unfortunate indeed when the only way the potato grower can pay his bills is through the failure of the crop in another section due to drought or other causes. If success in agriculture must be based on one section prospering on the misery of another, then we are in a sorry plight. The time has come when regional lines must be forgotten. No longer can the Maine or New Jersey or Idaho grower think of his section alone. Modern transportation has eliminated sectional lines. If the potato growers in the eastern states can make a living only when they ship potatoes to the west—and this because the western farmer has lost his crop—the whole industry becomes a gamble that the wildest speculator would avoid.

In the past we have thought only of how any attempt to regulate the potato industry would affect the particular section in which we live. Can we continue in this narrow viewpoint? Efforts are now being made to set up marketing agencies in various sections. A marketing organization which is limited to one section is doomed to almost certain failure if competing areas are permitted to run wild. If we are to have a regulated industry it must be on a national basis. It is time that we recognize this fact.